

were first noticed by Mr. Fox Talbot, and were ascribed by Sir David Brewster to a new property of light, consisting of a peculiar kind of polarity.

The author shows, that on the undulatory theory, in all cases, a difference of retardation between the two halves of each primary pencil throughout the spectrum may give bands within certain limits; and that it affords a complete explanation of the phenomena in question.

March 19, 1840.

The MARQUIS of NORTHAMPTON, President, in the Chair.

A paper was read, entitled "Contributions to Terrestrial Magnetism." By Major Edward Sabine, R.A., V.P.R.S.

An increased activity has recently been given to researches in terrestrial magnetism, with the definite object of obtaining correct maps of the magnetic phenomena, corresponding to the present epoch, over the whole surface of the globe. To aid these researches, and to facilitate the comparison of the general theory of M. Gauss with the facts of observation, maps have been constructed of the magnetical lines, both as computed by the theory, and as derived from observations already obtained. The theoretical and actual lines of the declination and intensity have thus been represented in maps recently published in Germany and England, as have also the lines of the inclination computed by theory; but the corresponding map or the latter element derived from observations is yet wanting. The object of the present communication is to supply this desideratum, as far as regards the portion of the globe contained between the parallels of 55° N. and 55° S., and the meridians of 20° E. and 80° W.; comprising the Atlantic ocean, and the adjacent coasts of the continents on either side.

The observations chiefly employed for this purpose are two series *made at sea*; one by Mr. Dunlop of the Paramatta observatory, in a voyage from England to New South Wales, in 1831; the other by Lieut. Sullivan of the Royal Navy, in a voyage from England to the Falkland Islands, and back, in 1838 and 1839. The observation of the magnetic dip at sea, which was commonly practised by the distinguished navigators of the last century, was unfortunately not resumed when the interest in such researches was revived on the restoration of peace: but it is by such observations only that the lines of inclination can be independently traced over those large portions of the globe which are covered by the ocean. The difficulties which attend the observation, occasioned by the motion and the iron of a ship, require the adoption of several precautions, which it is particularly desirable at this time to make generally known. The series of Messrs. Dunlop and Sullivan are discussed in this view; and the

value of results obtained under circumstances of due precaution is pointed out by their success.

The position of the lines on the land portion of the map is derived from 120 determinations in various parts of Europe, Africa, and America, between the years 1834 and 1839, of which about the half are now first communicated.

The series of Messrs. Dunlop and Sullivan contain also observations of the magnetic intensity made at sea; Mr. Dunlop's by the method of horizontal vibrations, and Lieut. Sullivan's by the instrument and method devised by Mr. Fox. The degree of precision which may be obtained by experiments thus conducted, is shown by the comparison of these observations with each other, and with the isodynamic lines previously derived from observations made on land.

The first section of this paper concludes with discussions on the relative positions of the lines of least intensity and of no dip, and of the secular change which the latter line has undergone in the ten years preceding 1837.

In the second section, the observations of Mr. Dunlop are combined with recent observations on the coasts of Australia, by Captains Fitz Roy, Bethune, and Wickham, of the Royal Navy, to furnish a first approximation to the position and direction of the isodynamic lines over that portion of the Indian ocean which is comprised between the meridian of the Cape of Good Hope and New South Wales.

A paper was also in part read, entitled "Experimental Researches in Electricity, seventeenth series." By Michael Faraday, Esq. D.C.L., F.R.S., &c., On the source of power in the Voltaic Pile.

March 26, 1840.

The MARQUIS of NORTHAMPTON, President, in the Chair.

The reading of a paper, entitled "Researches in Electricity, Seventeenth Series: on the source of power in the Voltaic Pile." By Michael Faraday, Esq., D.C.L., F.R.S., &c., was resumed and concluded.

In this series, the author continues his experimental investigation of the origin of electric force in the voltaic pile. Having found abundant reason, in the experiments already described, to believe that the electricity of the pile has its origin in the chemical force of the acting bodies, he proceeds to examine how the circumstances which can affect the affinity of substances for each other, influence their power of producing electric currents. First, with relation to *heat*:—circuits were made of a single metal and a single fluid, and these were examined with a view to ascertain whether, by applying